Exercise with Fast Sim : importance of PID (and forward PID) for B→ργ analysis

L. Burmistrov and A. Stocchi

Laboratoire de l Accélérateur Linéaire Université Paris-Sud 11

Phisical motivations

→ b→ dγ to determine $|V_{td}|$

→ ACP(B^+→ ργ) expected to be large in SM

→ Time dependent ACP(B^0→ $\rho^0\gamma$) expected to be small in SM but can be large in some non-SM models. That is why this chanel sensitive to new Physics

Background for B→ ργ

The decays b→sγ and dγ have small kinematical difference. Therefore K*γ is the important background of ργ and its branching fraction is one order of magnitude larger than the one B→ ργ

	Br	Number for 1 ab^{-1}	Ratio
B→ K*γ	$4.2\ 10^{-5}$	$2.8\ 10^{4}$	31
B→ ργ	$0.9\ 10^{-6}$	$0.9\ 10^{3}$	1

Exersises with Fast-Sim

Aim of the excercise with Fast-Sim : is to evaluate the effect of the PID to the Experimental sensistivity.

For today we concentrate on $B^0 \rightarrow \rho^0\gamma$

$B^0 \rightarrow \rho^0\gamma \rightarrow \pi^- \pi^+ \gamma$

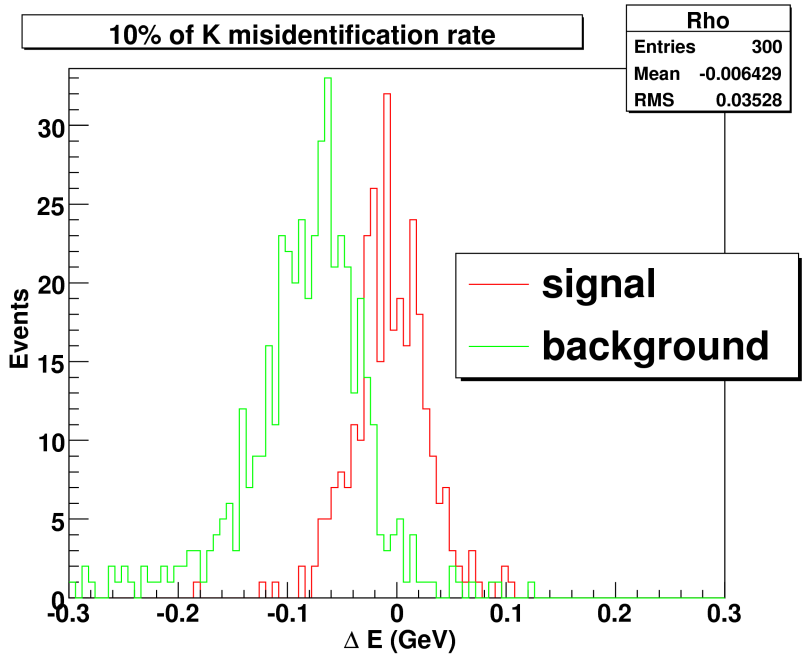
$B^0 \rightarrow K^{*0}\gamma \rightarrow \pi^- K^+ \gamma$

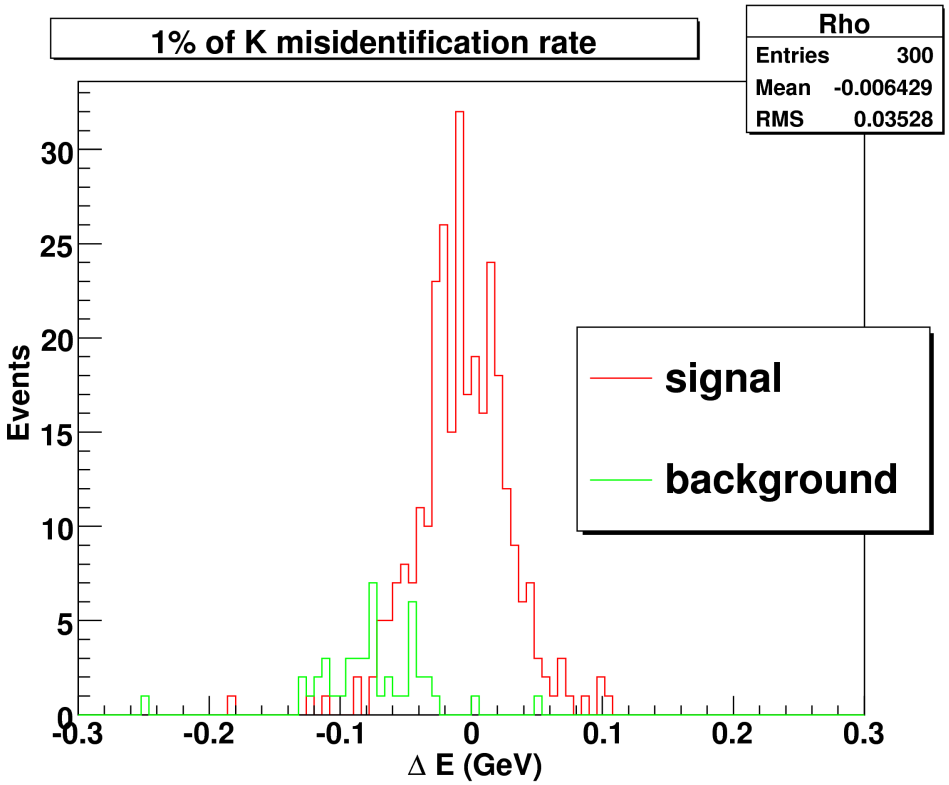
We generate two samples of events : $B^0 \rightarrow \rho^0\gamma$ ans $B^0 \rightarrow K^{*0}\gamma$ (detector and beam)

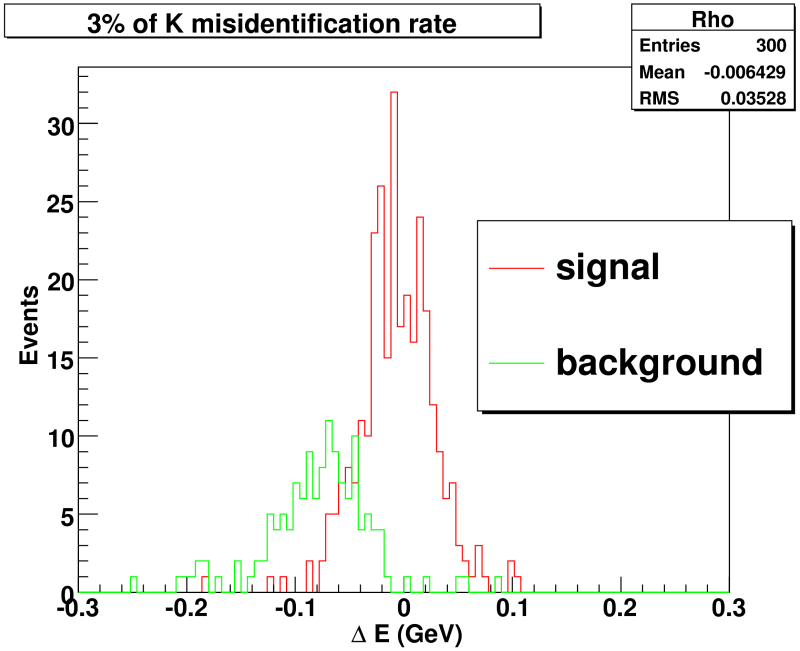
Analyse the two samples:

- $\pi\pi$ mass in the r region $|M(\pi\pi)-M(\rho)| < 0.2$ GeV/c^2
- $K\pi$ mass in the r region $|M(K\pi)-M(K^*)| > 0.08$ GeV/c^2
  (where the K is assigne to the particle with highest momentum in the pair)
- Construct mES variable and cut 5.275 GeV/c^2<mES<5.285
- Assume a given efficiency for pion identification and a given misidentication (π^-K^+)
- Look at ΔE variable

ΔE variable

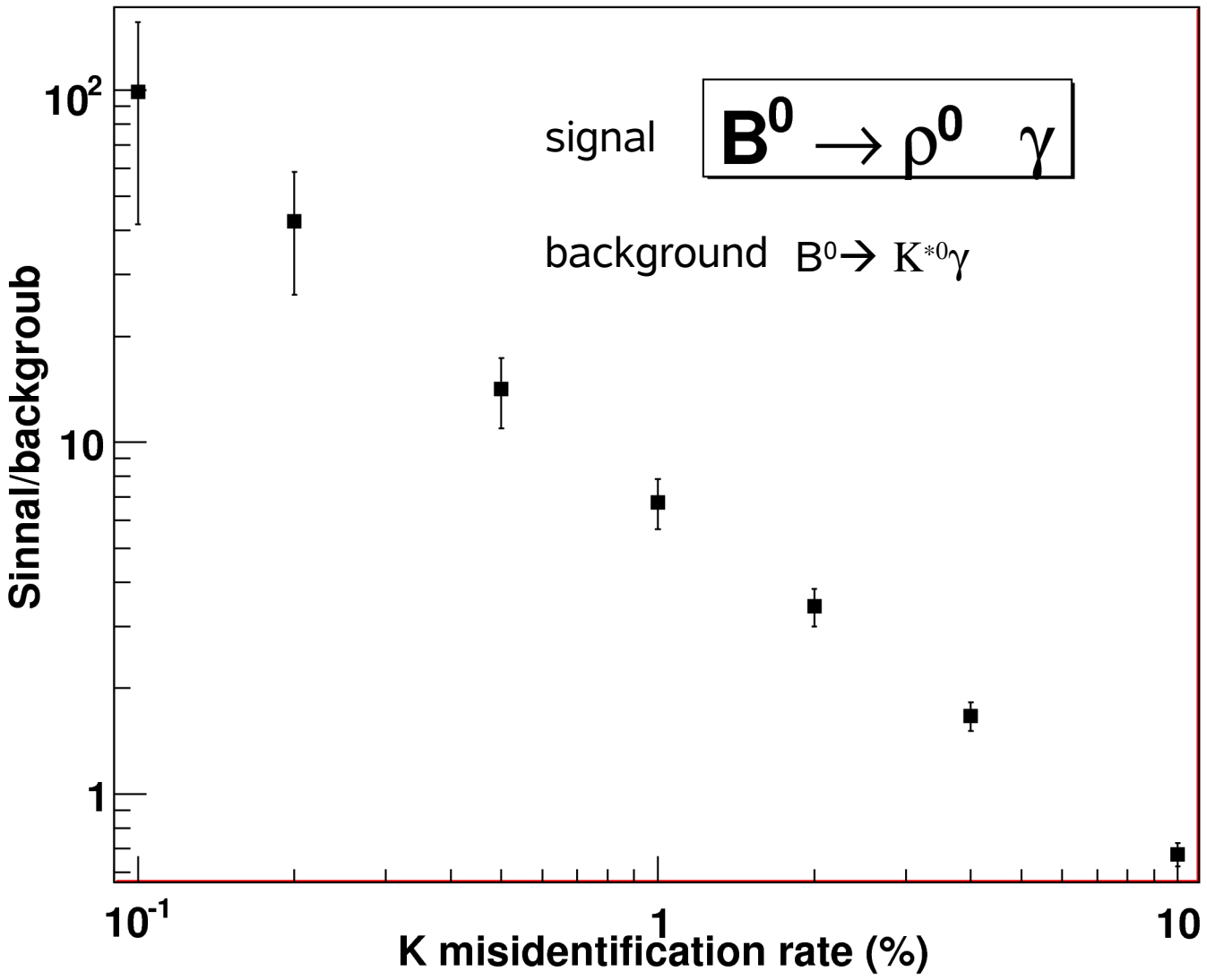






It seems that to have a good S/B ratio it is necessary to have better than 1% misidentification

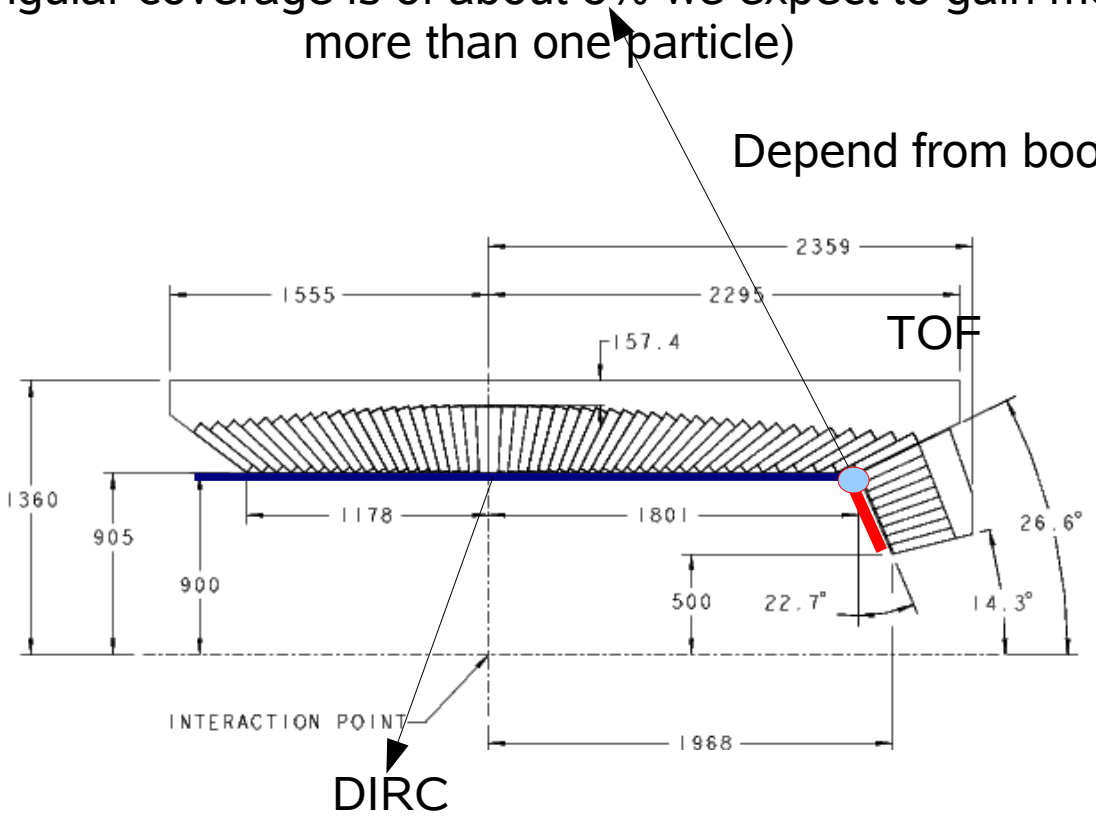
S/B ratio caluclauted using the events which are in the window -100MeV < ΔE < 100MeV



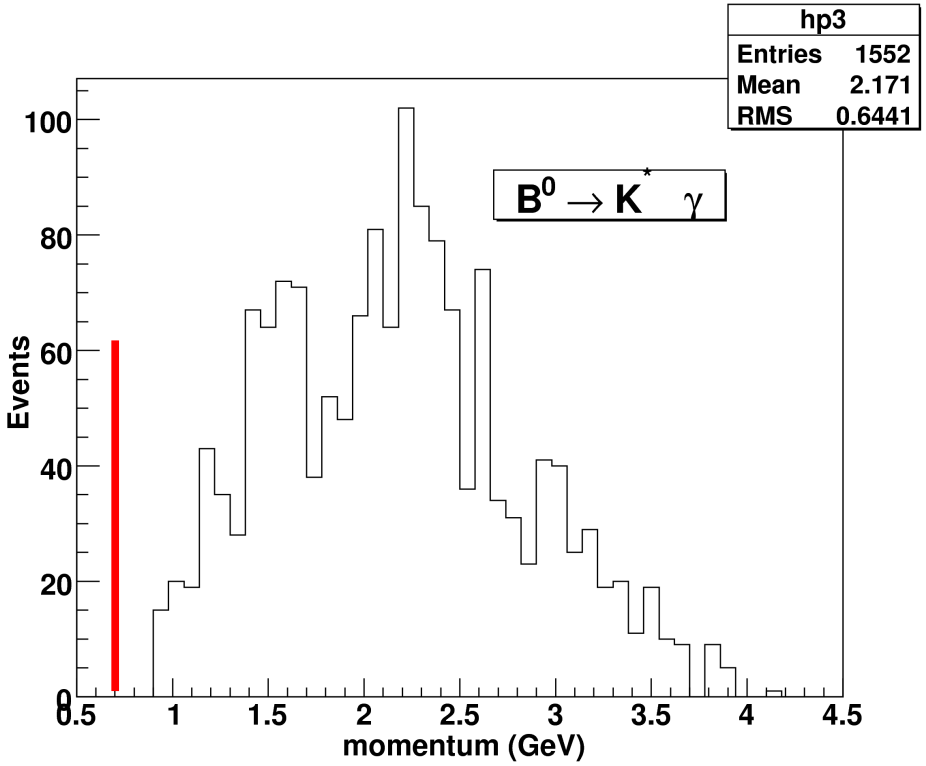
Misidentication ~1% necessary to have good S/B

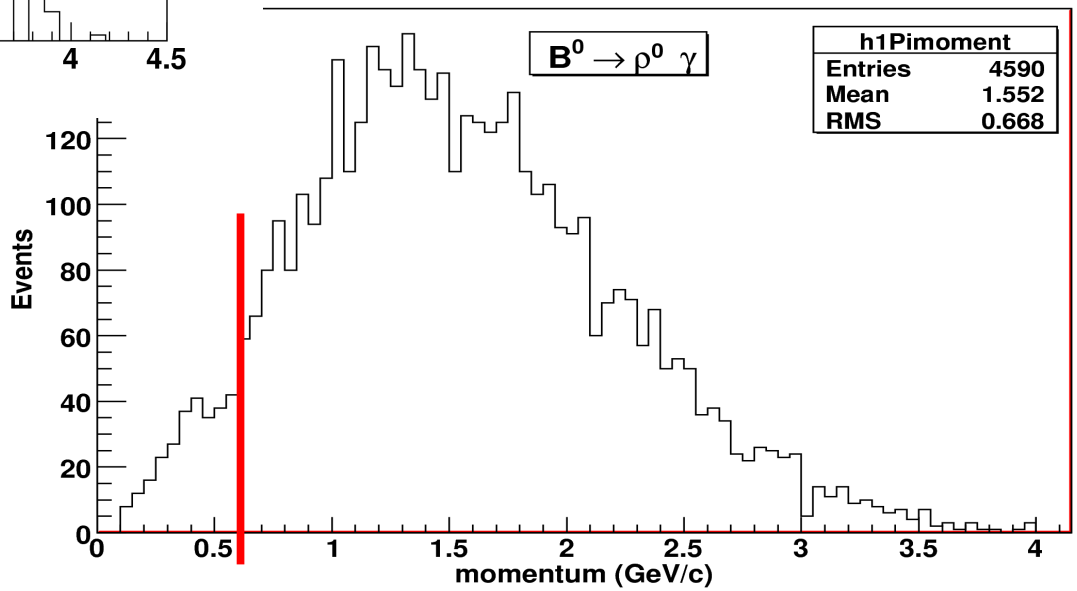
We want to evaluate how much we gain if we have forward PID

(even if the angular coverage is of about 8% we expect to gain more, if we have more than one particle)

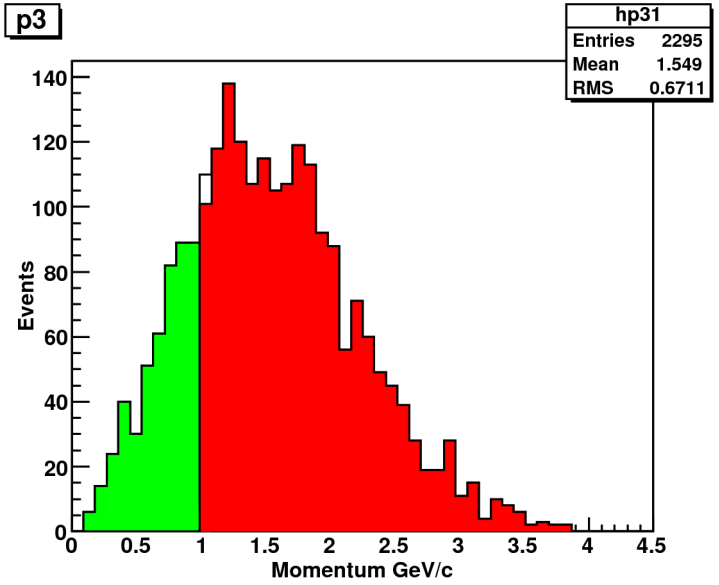


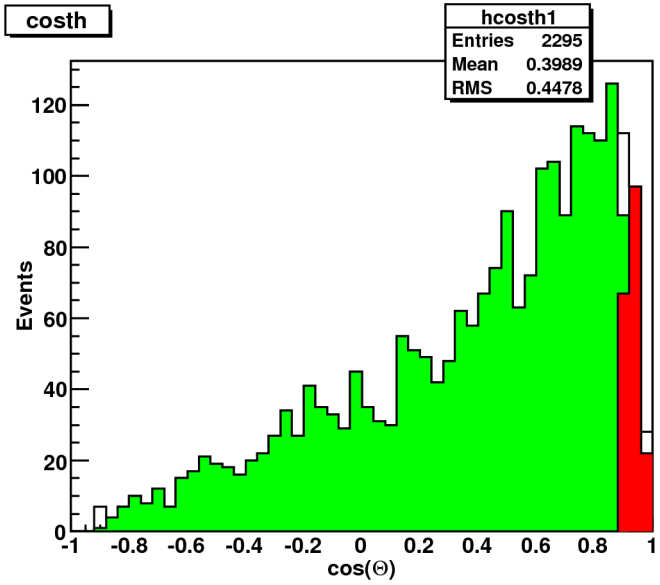
In our case we need to guarantee 1% misidentification for particles between 1 and 4 GeV/c

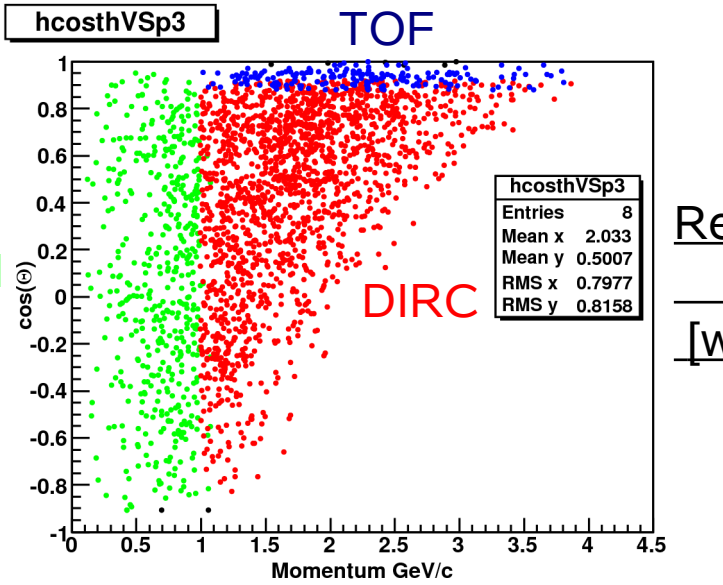




Our case $B^0 \rightarrow \rho^0\gamma \rightarrow \pi^- \quad \pi^+ \quad \gamma$





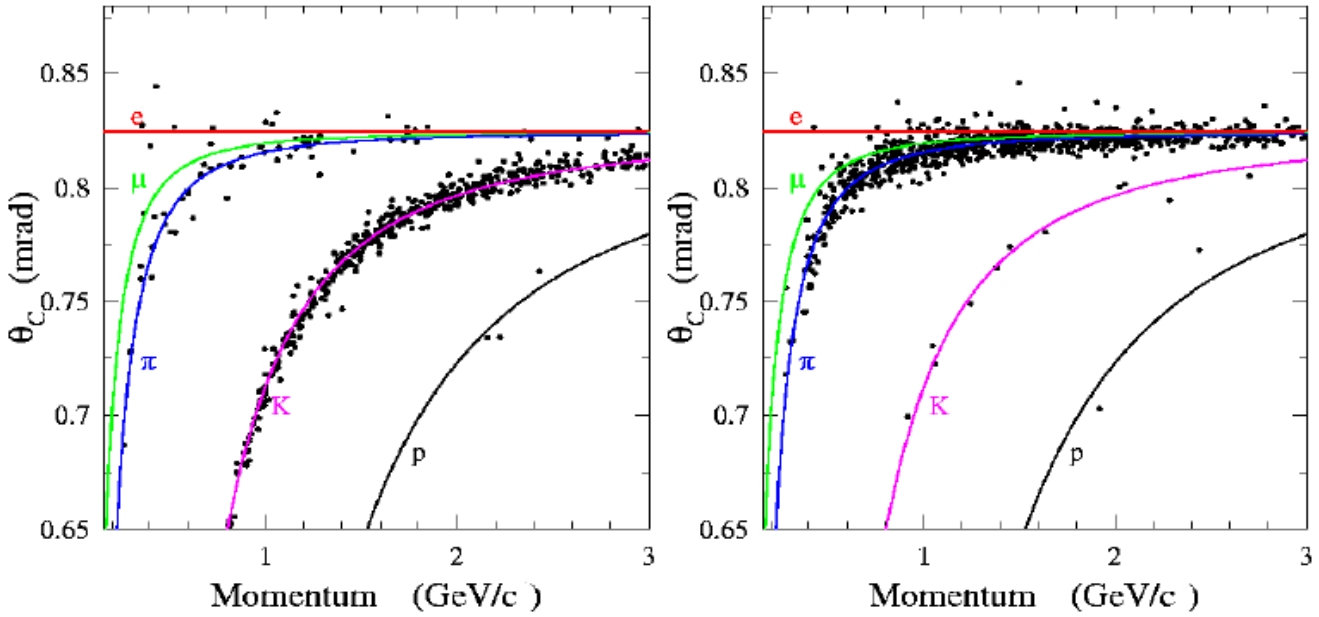


if we suppose that all the partciles with p>1GeV are accepted (1% misid.) than :

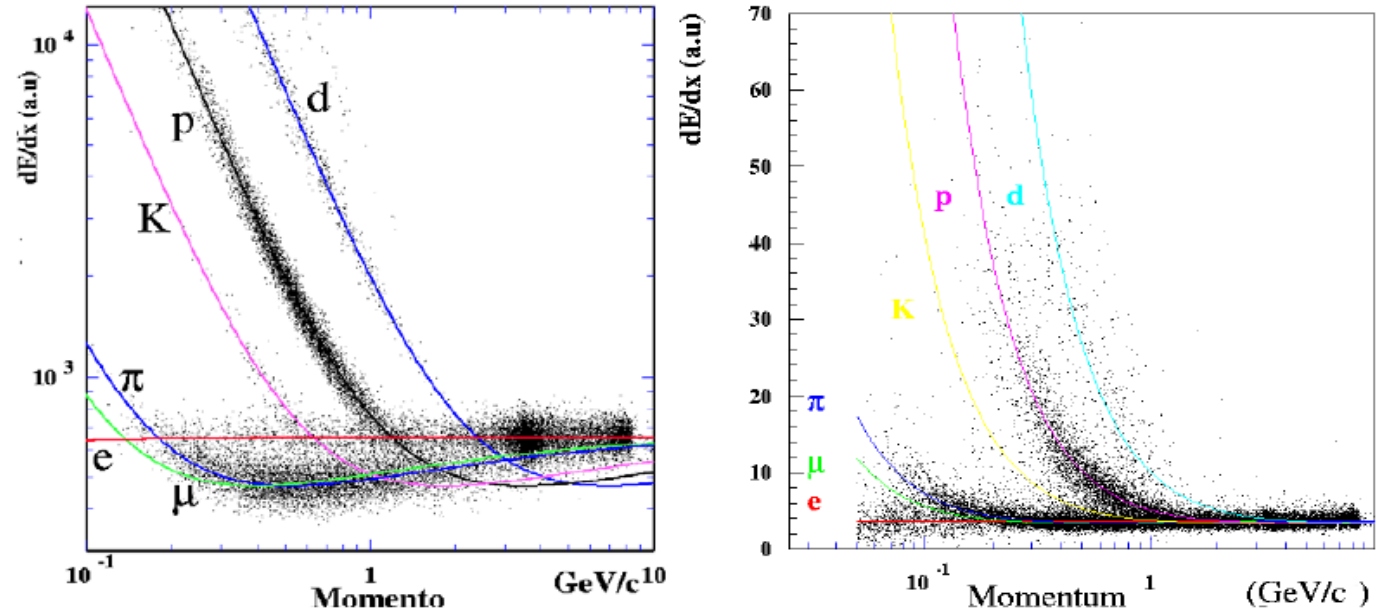
Result :

N($B^0 \rightarrow \rho^0\gamma$) [with forward PID] / N($B0 \rightarrow \rho 0\gamma$) [without forward PID] = 13 %

In future with the Fast-Sim information of dE/DX.Cerenkov angle, time…

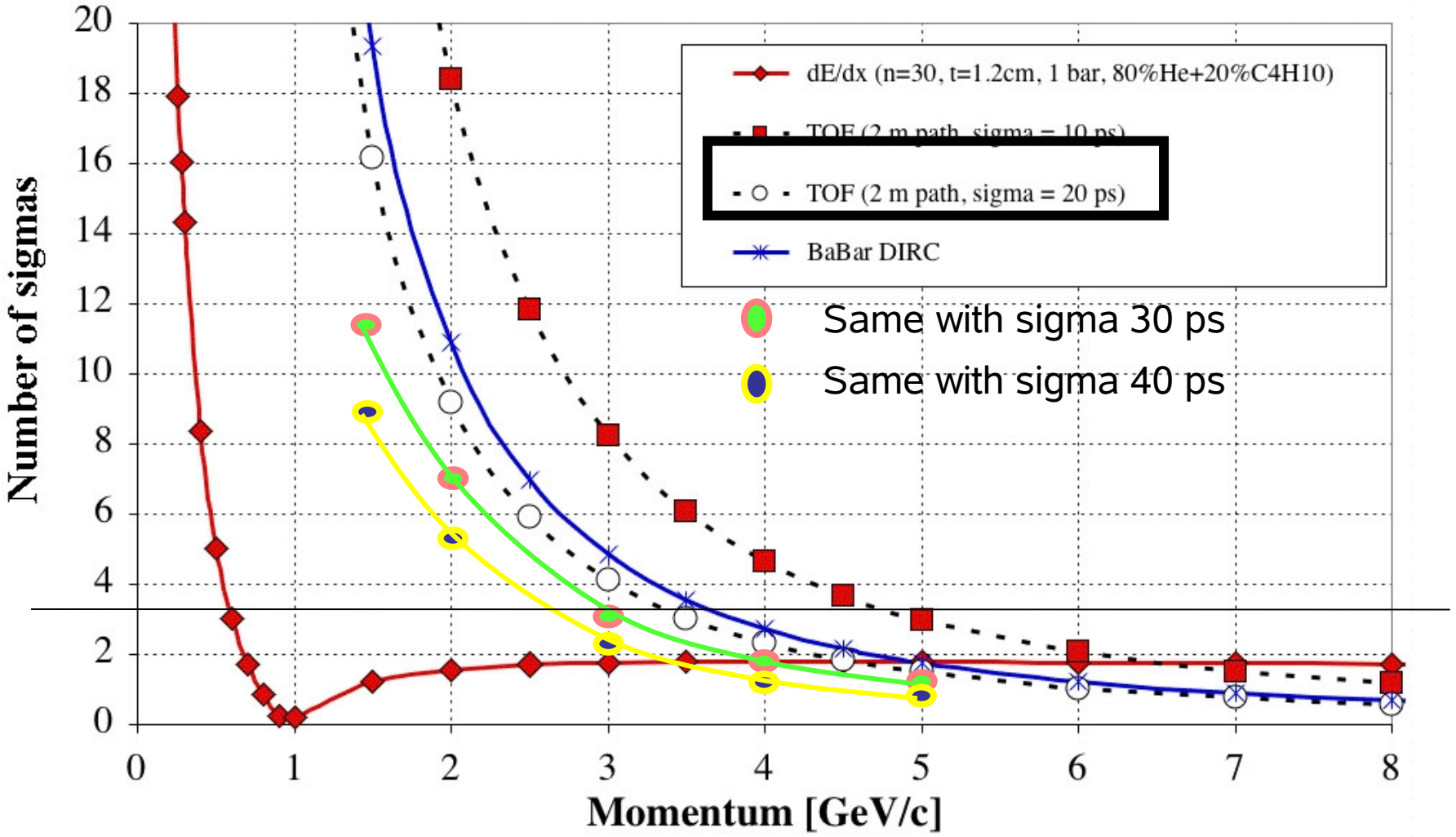


Cerenkov



dE/DX

PID K/π with different detectors



TOF with 20 ps same separation as for the BaBar DIRC

20 ps resolution in time are they realistic ?

30 ps resolution could be still interesting

have to be simulated